

**NEVER** touch metal fasteners with metal package opening devices when opening packages of explosive materials.

**NEVER** mix different explosives in the same package.

## **PROTECTING EXPLOSIVE MATERIALS**

**ALWAYS** insure that there are no foreign objects, loose powder or moisture in a non-electric detonator before inserting safety fuse/detonating cord.

**NEVER** investigate the contents of a detonator.

**NEVER** pull wires, safety fuse, shock tube, or detonating cord out of any detonator or delay device.

**NEVER** strike explosive materials with, or allow them to be hit by hard, heavy objects.

**NEVER** subject explosive materials to excessive impact or friction.

**NEVER** allow loaded firearms in the vicinity of, nor shoot near, explosive materials, magazines, or vehicles loaded with explosive materials.

## **USING EXPLOSIVE MATERIALS - GENERAL**

### Protecting Yourself:

**ALWAYS** keep explosive materials away from food, eyes, and skin.

**ALWAYS** avoid exposure to excessive noise from detonations.

**ALWAYS** initiate the detonation from a position outside the blast area away from any area where shrapnel might occur.

**ALWAYS** remain in a position away from the blast area until post blast fumes, dust, or mist have subsided.

**NEVER** position yourself near any explosive materials when initiating a detonation.

**NEVER** breathe dust or vapors from explosive materials, or fumes from detonated or burnt explosives.

### Protecting Others:

**ALWAYS** clear the immediate area of persons.

**ALWAYS** post guards or place barriers to prevent access to the blast area.

**ALWAYS** sound adequate warning prior to initiating the detonation.

**NEVER** initiate a detonation without a positive signal from the person in charge.

**NEVER** permit anyone to handle explosive materials or position themselves near explosive materials when a detonation is to be initiated.

#### Protecting the Blast Area:

**ALWAYS** clear the immediate area of vehicles, equipment, and extra explosive materials.

**NEVER** allow any source of initiation within 50 feet of a detonation site except approved safety fuse lighters if initiation is to be a non-electric system.

### USING EXPLOSIVE MATERIALS - ELECTRIC DETONATORS

**ALWAYS** test the circuit for continuity and proper resistance, using a blasting galvanometer or an instrument specifically designed for testing electric detonators and circuits containing them.

**ALWAYS** fire electric detonators with firing currents or voltage in the range recommended by the manufacturer.

**ALWAYS** keep electric detonator wires or lead wires disconnected from the power source and shunted until ready to test or fire.

**ALWAYS** keep the firing circuit completely insulated from the ground or other conductors.

**ALWAYS** be sure that all wire ends are clean before connecting.

**NEVER** set up a detonation near electric power lines unless the firing line and detonator wires are anchored or are too short to reach the power line(s).

**NEVER** handle or use electric detonators;

- When stray currents are present.
- During electrical storms.
- If static electricity is present.



**NEVER** use any instruments, such as electrician's meters, that are not specifically designed for testing blasting circuits or detonators. Such meters could produce sufficient electrical energy to prematurely initiate electric detonators.

**NEVER** use electric detonators near radio-frequency transmitters, except those approved for use in RF environments.

**NEVER** mix electric detonators made by different manufacturers in the same circuit.

**NEVER** mix electric detonators of different types in a circuit, even if made by the same manufacturer, unless such as is approved by the manufacturer.

**NEVER** use aluminum wire in a blasting circuit.

**NEVER** open blasting machines or handle batteries near electric detonators.

**NEVER** make final hookup to power source until all personnel are clear of the blast area.

**NEVER** load or use primary explosives, such as lead azide, in copper shells.

**NEVER** crimp electric detonators over the mid-section that contains primary explosives.

## **USING EXPLOSIVE MATERIALS - DETONATING CORD**

**ALWAYS** handle detonating cord as carefully as other explosive materials.

**ALWAYS** cut the detonating cord from the spool before attempting to couple the cord to the rest of the explosive materials.

**ALWAYS** use a sharp knife, razor blade or instrument designed for cutting detonating cord.

**ALWAYS** attach detonators to detonating cord with tape or use methods recommended by the manufacturer.



**ALWAYS** point the detonators toward the direction of detonation.

**NEVER** make loops, kinks or sharp angles in the cord, which might direct the cord back toward the oncoming line of detonation.

**NEVER** cut detonating cord with devices such as scissors, pliers type cutters, or similar items.

**NEVER** attach detonators for initiating the blast to detonating cord until the blast area has been cleared and secured for the detonation.

**NEVER** use damaged detonating cord.

## **USING EXPLOSIVE MATERIALS - SAFETY FUSE & DETONATOR**

### **General:**

**ALWAYS** handle fuse carefully to avoid damaging the covering. In cooler weather, warm fuse slightly before use to avoid cracking the water proofing.

**ALWAYS** know the burning speed of the safety fuse by conducting a test burn of the fuse to be used.

**NEVER** use lengths of safety fuse less than three (3) feet.

**NEVER** insert safety fuse in the open end of a non-electric detonator in a rough manner.

**NEVER** use fuse, which has been kinked, bent sharply, or handled roughly in such a manner that the powder train may be interrupted.

### **Assembling Fuse and Detonator:**

**ALWAYS** cut off an inch or two to ensure a dry end. Cut fuse squarely across with a tool designed for this purpose.

**ALWAYS** seat the fuse lightly against the detonator charge and avoid twisting after the fuse is seated.

**ALWAYS** ensure that the detonator is securely crimped to the fuse.

**ALWAYS** use cap crimpers to crimp the detonator to the safety fuse.

**NEVER** twist the fuse inside the detonator.

**NEVER** use a knife or teeth for crimping.

**NEVER** cut fuse until you are ready to insert it into the detonator.

**NEVER** crimp detonators by any means except a cap crimper designed for that purpose.

**NEVER** attempt to remove a detonator from the fuse it is crimped to.

#### Lighting the Fuse:

**ALWAYS** light fuse with a fuse lighter designed for the purpose.

**ALWAYS** use the "buddy system" when lighting safety fuse - one lights the fuse, the other times and monitors.

**NEVER** hold explosives when lighting fuse.

**NEVER** use matches, cigarette lighters, cigarettes, pipes, cigars, or other unsafe means to ignite safety fuse.

### **AFTER DETONATION PROCEDURES**

#### Disposal of Explosive Materials:

**ALWAYS** treat deteriorated or damaged explosive materials with special care. They are most likely more hazardous than explosive materials in good condition.

**ALWAYS** dispose of explosive materials using approved methods.

**NEVER** reuse any damaged explosive material packaging.

**NEVER** burn explosive materials packaging in a confined space.

#### Misfires:

**ALWAYS** wait at least thirty (30) minutes before approaching a misfire when safety fuse and non-electric detonator was used.

**ALWAYS** wait at least fifteen (15) minutes before approaching a misfire when an electric detonator was used.

**ALWAYS** shunt the bare wires of a misfired electric detonator by twisting them together and then tape them to the metal shell to protect against extraneous sources of electrical energy.

**ALWAYS** wait one (1) hour before approaching a misfire when a time delay fuse was used.

**NEVER** drill, bore, or pick out any explosive materials that have been misfired. Misfires should **ONLY** be handled by a competent, experienced person knowledgeable of the types, amounts, and location of all explosive materials involved in the misfire.

#### Detonation Fumes:

**ALWAYS** assume toxic fumes are present from all detonations or burning explosive materials and stay away until they have dissipated.

### HAZARD COMMUNICATION

#### General:

The goal of a hazard communication program is to reduce the chance of illnesses and injuries to employees by providing as much information as needed to understand the hazards of the materials the employees may be exposed to in their work. This is accomplished through proper labeling of containers of hazardous materials, publishing a hazardous product list and preparing Material Safety Data Sheets (MSDSs).

In addition to the obvious hazard, encountered daily at the Explosive Products Center, other products, such as the following, can affect employees; Corrosives (acids), Irritants (solvents), Sensitizes (epoxies), and Toxins (carbon monoxide).

#### Labeling:

All containers of explosive materials, chemicals, etc. received from manufacturers or distributors should be properly labeled identifying the contents. In addition to relating the container contents, the label should identify the hazards associated with the contents and name and address of the manufacturer. No hazardous material shipment should be received if proper labels are not in place.

When transferring hazardous materials container contents into smaller containers, a proper label should be applied to the new container.

Containers with any explosive, or other hazardous material, should never be stored without proper labeling.

#### Hazardous Product List:

Each building/location where explosive operations are conducted will have a list of hazardous products used by employees in that operational location. The list should be in alphabetic order with the manufacturer's name. If an employee has any question about a product on the list, a Material Safety Data Sheet on that product should be requested.

Material Safety Data Sheets (MSDS):

These are technical data sheets prepared by manufacturers of hazardous, or potentially hazardous, materials. The MSDS should contain the following minimal information:

- a) Identification of the product, including the chemical and common names.
- b) Physical and chemical characteristics of the product.
- c) Known acute and chronic health effects and related information.
- d) Exposure Limit.
- e) Whether product is considered carcinogenic.
- f) Precautionary measures to take when using the product.
- g) Identification of person who prepared MSDS.
- h) Emergency and first aid procedures.



## **Standard Operating Procedures (SOP) SYSTEMS USING ELECTRIC DETONATORS**

**Service Supervisor (BLASTER) will have the blasting machine/firing device in his/her possession at all times.**

1. Check the electric detonator and firing circuits with the **APPROVED** blasting multimeter or galvanometer. With the **detonator in the safety tube**.
2. Check the firing cable to ensure that it is properly shunted at the firing end.
3. With the detonator in the safety tube, connect the detonator lead wires to the firing cable.
4. Place the detonator/s securely into its position in the firing train.
5. All personnel will withdraw to the firing position making visual checks of the immediate vicinity to ensure that no unauthorized persons have entered the **LOCATION / BLAST SITE**.
6. Check the firing cable and connect to the appropriate blasting machine.
7. Sound audio warning system or predetermine signal.
8. Activate the blasting machine to initiate the explosive train.
9. Disconnect the blasting machine and shunt the firing line.
10. Allow at least one (1) minute to transpire before leaving the safety of the blast shelter or protected area.





**Misfire Procedures** - Whenever an electric firing system is utilized there is a possibility of a misfire. Should the first attempt to fire result in a misfire, at least two more attempts to initiate the blast will be made. If there is still no initiation, disconnect the blasting machine, shunt the firing cable and wait at least 15 minutes before approaching the Blast Site to investigate.

**Because of the strong energy released by lightning, the loading of explosives should be suspended and personnel should be removed to a safe area at the approach and duration of an electrical storm, regardless of the initiation system.**

## **SYSTEMS USING Exploding Bridgewire (EBW).**

**Service Supervisor (BLASTER) will have the control unit / fire set in his / her possession at all times.**

1. Check the EBW detonator and firing circuits with the **APPROVED** blasting multimeter or galvanometer. Only the high voltage, low voltage cables and EBW can be checked, with the **detonator in the safety tube.**
2. Check the firing cable to ensure that it is properly shunted at the firing end.
3. With the detonator in the safety tube, connect the detonator lead wires to the firing cable.
4. Place the detonator/s securely into its position in the firing train.
5. All personnel will withdraw to the firing position making visual checks of the immediate vicinity to ensure that no unauthorized persons have entered the **LOCATION / BLAST SITE.**
6. Check the firing cable and connect to the appropriate control unit/fire set.
7. Sound audio warning system or predetermine signal.
8. Activate the control unit/fire set to initiate the explosive train.
9. Disconnect the control unit/fire set and shunt the firing line.



10. Allow at least one (1) minute to transpire before leaving the safety of the blast shelter or protected area.

**Misfire Procedures** - Whenever an electric firing system is utilized there is a possibility of a misfire. Should the first attempt to fire result in a misfire, at least two more attempts to initiate the blast will be made. If there is still no initiation, disconnect the control unit/fire set, shunt the firing cable and wait at least 15 minutes before approaching the Blast Site to investigate.

## **SYSTEMS USING NON- ELECTRIC DETONATORS**

**Safety Fuse** is not approved for Specialty Services operations, only the Nonelectric initiation System and detonators.

**Service Supervisor (BLASTER)** will have the blasting machine/firing device in his/her possession at all times.

Although nonelectric firing systems are generally less susceptible to accidental firing by stray current or radio frequency energy than electric firing systems, they all contain sensitive primary explosives and pyrotechnics. As such, they should not be considered impervious to accidental initiation by lightning, static electricity, or strong electrical fields. Because of the strong energy released by lightning, the loading of explosives should be suspended and personnel should be removed to a safe area at the approach and duration of an electrical storm, regardless of the initiation system.